EVAL-LTC2065/LTC2068-TQFN User Guide

UG-1761

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Evaluating the LTC2065 and LTC2068 µA Supply Current, Low I_B, Zero-Drift, Op Amp

FEATURES

Fully featured evaluation board for the LTC2065/LTC2068
Enables efficient prototyping
User defined circuit configuration
Simplified connection to test equipment and other circuits

EVALUATION KIT CONTENTS

EVAL-LTC2065/LTC2068-TQFN

EQUIPMENT NEEDED

Dual-output dc power supply
Dual-channel signal generator
Oscilloscope
Banana jack to grabber cables
BNC to grabber cables

DOCUMENTS NEEDED

LTC2065/LTC2068 data sheet

GENERAL DESCRIPTION

The EVAL-LTC2065/LTC2068-TQFN evaluates the LTC2065 and LTC2068 16-lead, quad-channel, lead frame chip scale package (LFCSP)/quad flat no-lead (QFN) operational amplifier (op amp). The EVAL-LTC2065/LTC2068-TQFN is a prepopulated board using a gain of 2 configuration with a low-pass filter at the noninverting input. This filter has a cutoff frequency of 480 Hz for the LTC2065 and 2.4 kHz for the LTC2068. This frequency minimizes the effect of chopper clock feedthrough to at least a decade below the internal chopping frequency of 5 kHz and 25 kHz for the LTC2065 and LTC2068, respectively. Signal bandwidths are also limited due to slew rate limitations of the devices.

The EVAL-LTC2065/LTC2068-TQFN design allows simplified and efficient use. Bulk test points are used for the inputs and outputs. The optimized EVAL-LTC2065/LTC2068-TQFN ground plane, component placement, and power supply allow maximum circuit flexibility and performance. The exposed pad (EPAD) is shorted to the V^- pin (also connected to the VS– turret), which is required for device operation. The EVAL-LTC2065/LTC2068-TQFN combines surface-mount technology (SMT) with almost all components being 0805 in size to provide simplified installation and the option to replace and solder when needed, except for the bypass capacitors (C1 to C4) that are fixed in 0603 sizes. The EVAL-LTC2065/LTC2068-TQFN also has unpopulated resistor and capacitor pads, which provide the user with the options and flexibility to implement different application circuits and configurations, such as active loop filters, transimpedance amplifiers (TIAs), and sense amplifiers.

Figure 1 shows the top view of the evaluation board, and Figure 2 shows the bottom view.

EVALUATION BOARD PHOTOGRAPHS

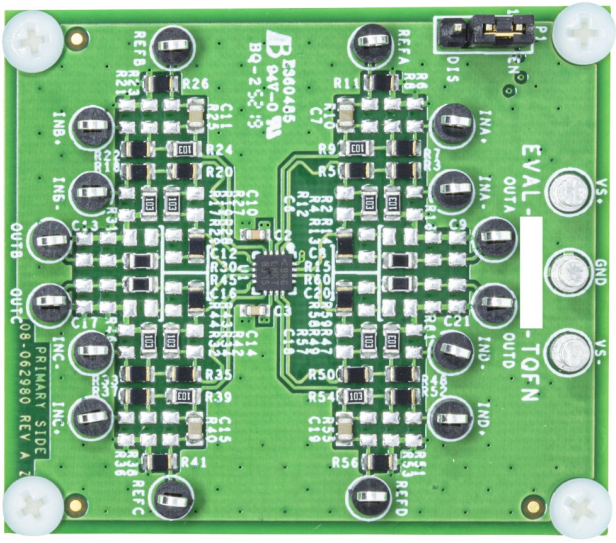

Figure 1. EVAL-LTC2065/LTC2068-TQFN, Primary Side

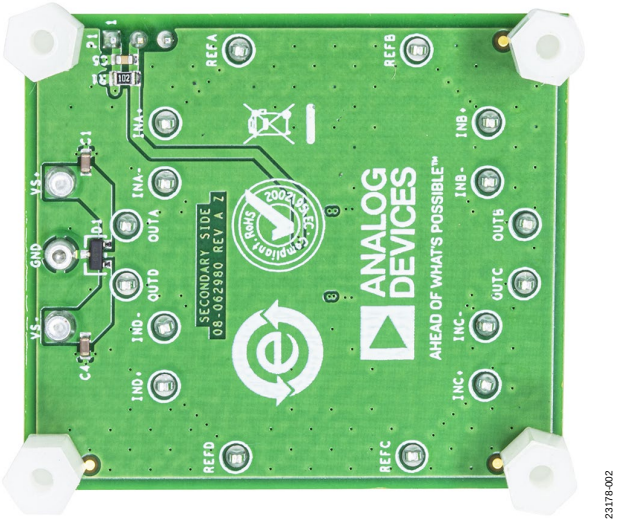

Figure 2. EVAL-LTC2065/LTC2068-TQFN, Secondary Side

Refer to the LTC2065 and LTC2068 data sheet for full specifications in conjunction with this user guide when using the EVAL-LTC2065/LTC2068-TQFN.

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REVISION HISTORY

7/2020—Rev. 0 to Rev. A

Changed Evaluation Board Name from EVAL-LTC2065-TQFN to EVAL-LTC2065/LTC2068-TQFN ..... Throughout
Changes to User Guide Title, Features Section, Documents Needed Section, General Description Section, and Figure 1 1
Changes to Table 1 7

3/2020—Revision 0: Initial Version

EVALUATION BOARD QUICK START PROCEDURES

The following sections outline the basic, prepopulated EVAL-LTC2065/LTC2068-TQFN configuration required to test the basic functionality of the device. All LTC2065 and LTC2068 channels are set up with the same configuration. Channel A is used as an example in the following sections.

POWER SUPPLY CONSIDERATION

Use the turret pins (VS+, VS−, and GND) to power up the EVAL-LTC2065/LTC2068-TQFN. Ensure that the correct polarity and voltage level is used to avoid reverse polarity and overvoltage, which can permanently damage the EVAL-LTC2065/LTC2068-TQFN. The operating supply voltage range is from 1.7 V to 5.25 V. Higher voltages can damage the amplifier. Decoupling capacitors of 10 µF and 0.1 µF are preinstalled on the EVAL-LTC2065/LTC2068-TQFN for ready operation.

INITIAL BOARD CONFIGURATION

To set up the initial EVAL-LTC2065/LTC2068-TQFN configuration, take the following steps:

1. Ensure that all equipment is powered down, including the power supply and the signal generator. Use the banana jack to grabber cables to connect the positive supply, ground, and negative supply to the VS+, VS−, and GND turret pins, respectively.
2. Verify that the P1 jumper for $\overline{\text{SHDN}}$ is in Position 1 (labeled EN) so that the device is enabled.
3. Connect the signal generator at the INA+ bulk test point and GND turret using a BNC to grabber cable to evaluate Channel A.
4. Connect the oscilloscope 10× probe to the OUTA bulk test point and clip the oscilloscope 10× probe GND to the GND turret.

USING THE EVALUATION BOARD FOR TESTING

When the procedure in the Initial Board Configuration section is complete, implement the following settings and verify the expected output:

1. Set the power supply to 2.5 V for the positive supply and −2.5 V for the negative supply, and then turn on the power supply.
2. Configure the signal generator to output a 100 Hz sine wave with 0 V offset and 0.5 V p-p and enable the generator.
3. Set the oscilloscope scaling to 200 mV/2 ms per division, the input impedance to 1 MΩ, and the oscilloscope probe attenuation factor to 10×. Ensure that a 100 Hz, 1 V p-p sine wave centered at 0 V appears on the oscilloscope.
4. To evaluate the device shutdown performance, move the P1 jumper into Position 3 (labeled DIS) to tie $\overline{\text{SHDN}}$ to VS−. There is no output at the OUTA bulk test point. To reenable the device, move the P1 jumper back into Position 1 (labeled EN).

Move to the next channel and repeat Step 2 and Step 3 to test the device functionality of that channel.

EVALUATION BOARD SCHEMATICS AND ARTWORK

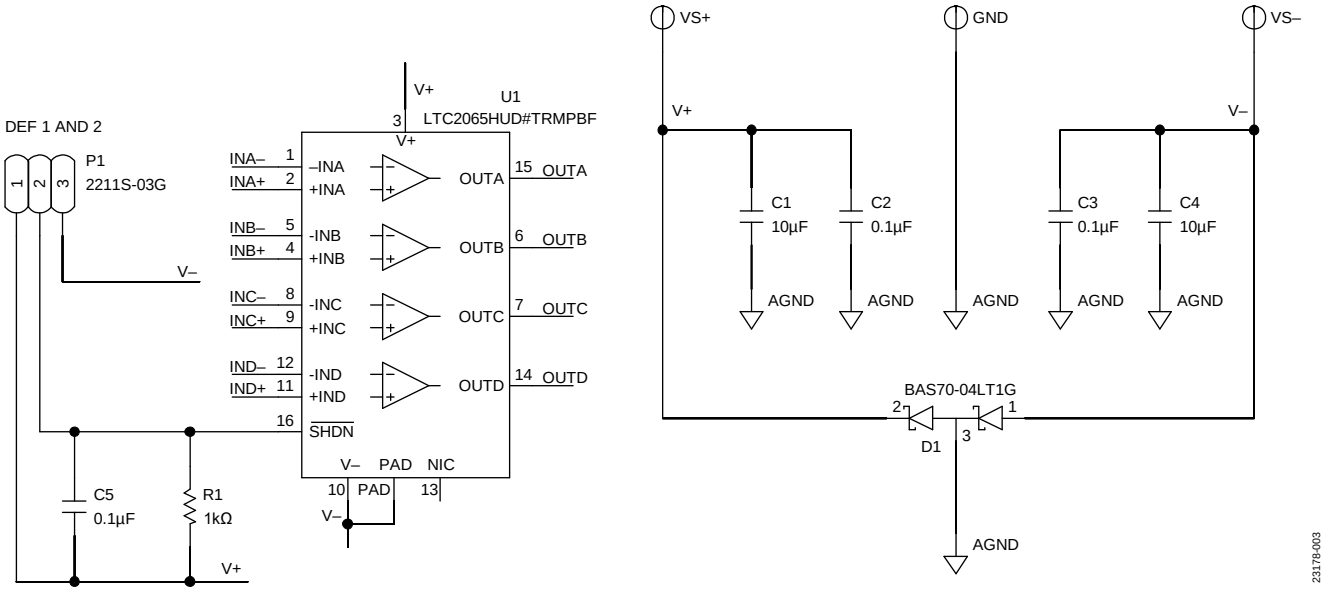

Figure 3. EVAL-LTC2065/LTC2068-TQFN Schematic, Page 1

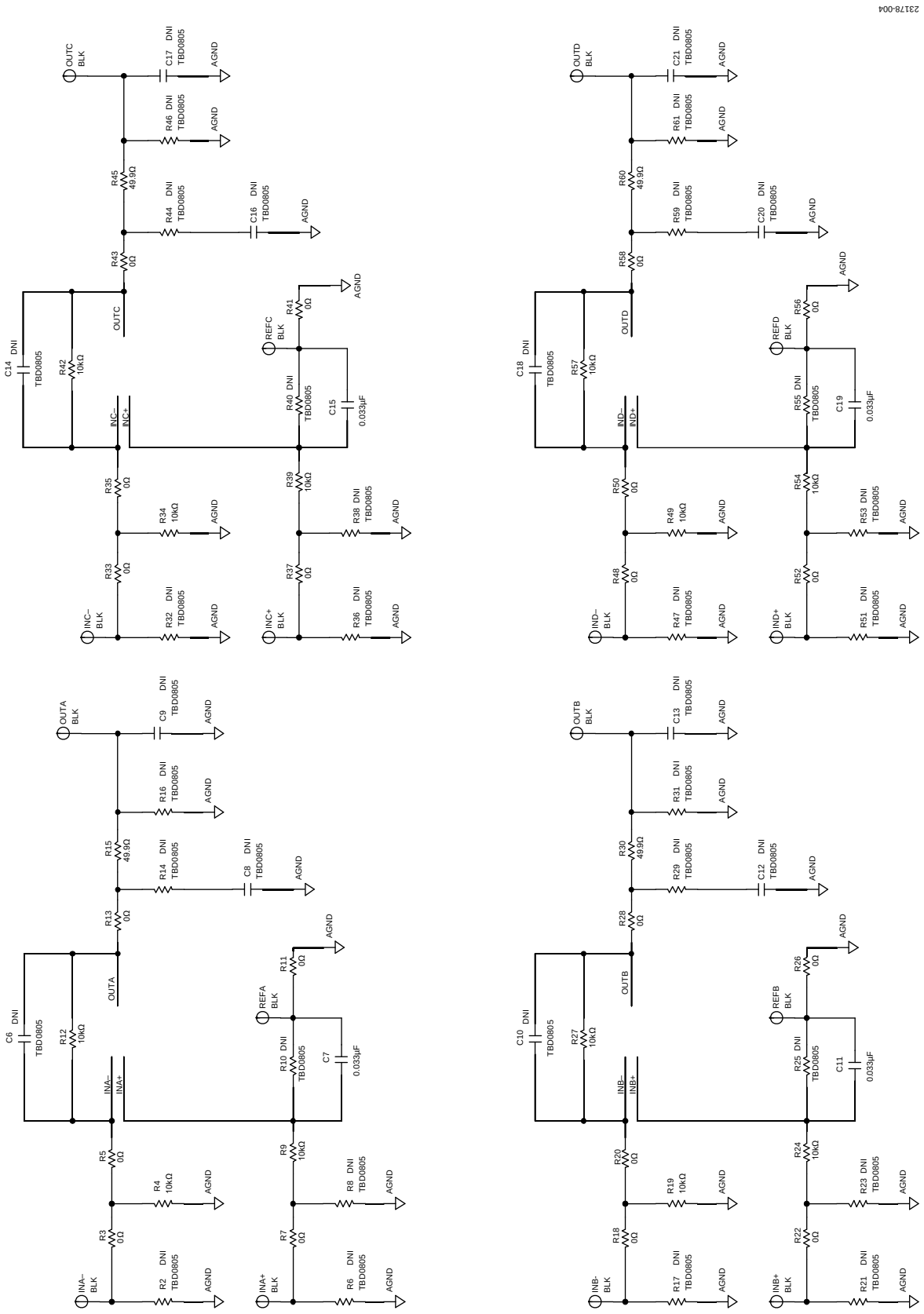

Figure 4. EVAL-LTC2065/LTC2068-TQFN Schematic, Page 2

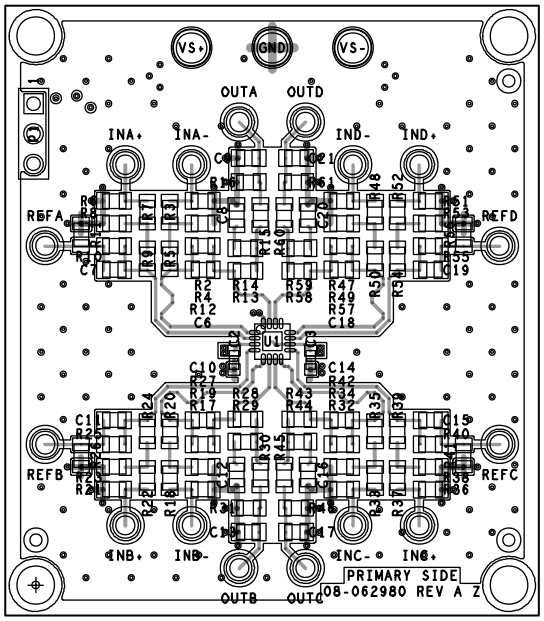

Figure 5. EVAL-LTC2065/LTC2068-TQFN Layout Pattern, Primary Side

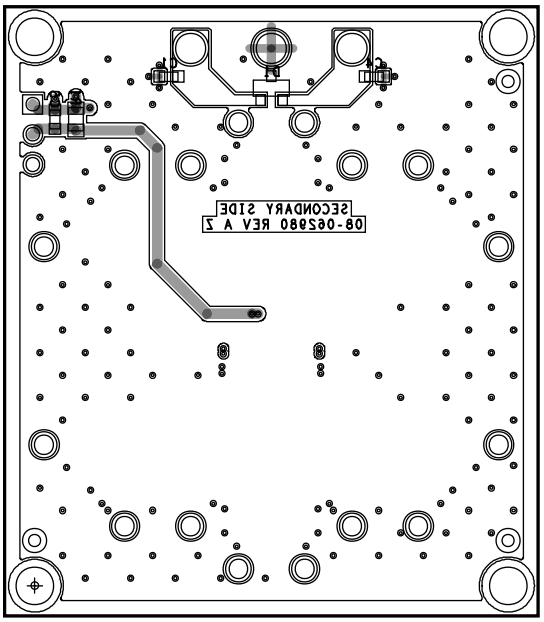

Figure 6. EVAL-LTC2065/LTC2068-TQFN Layout Pattern, Secondary Side

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference Designator	Description	Supplier	Part Number
1	U1	µA supply current, low I_B, zero-drift, op amp	Analog Devices	LTC2065HUD#TRMPBF or LTC2068HUD#TRMPBF
2	C1, C4	Ceramic capacitors, X5R, 0603, 10 µF	Murata	GRM188R61E106KA73D
3	C2, C3, C5	Ceramic capacitors, X7R, 0603, 0.1 µF	Kemet	C0603C104K3RACTU
12	C6, C8 to C10, C12 to C14, C16 to C18, C20, C21	Capacitors, 0805, user defined	Not applicable	Not applicable
4	C7, C11, C15, C19	Ceramic capacitors, X7R, 0805, 0.033 µF (for LTC2065)	Phycomp (Yageo)	2238 580 15643
		Ceramic capacitors, C0G(NP0), 0805, 0.0068 µF (for LTC2068)		GRM2195C1H682JA01D
1	D1	Diode Schottky barrier	ON Semiconductor	BAS70-04LT1G
3	GND, VS+, VS−	PCB connector, terminal turrets	Mill-Max	2501-2-00-80-00-00-07-0
16	INA+, INA−, INB+, INB−, INC+, INC−, IND+, IND−, OUTA, OUTB, OUTC, OUTD, REFA, REFB, REFC, REFD	PCB connector, bulk test points	Keystone Electronics	5006
1	P1	Printed circuit board (PCB) connector, 3-position, male header	Multicomp (SPC)	2211S-03G
12	R4, R9, R12, R19, R24, R27, R34, R39, R42, R49, R54, R57	Resistors, 10 kΩ	Panasonic	ERA-6AEB103V
1	R1	Resistor, 1 kΩ	Panasonic	ERA-6AEB102V
4	R15, R30, R45, R60	Resistors, 49.9 Ω	Panasonic	ERA-6AEB49R9V
24	R2, R6, R8, R10, R14, R16, R17, R21, R23, R25, R29, R31, R32, R36, R38, R40, R44, R46, R47, R51, R53, R55, R59, R61	Resistors, 0805, user defined	Not applicable	Not applicable
20	R3, R5, R7, R11, R13, R18, R20, R22, R26, R28, R33, R35, R37, R41, R43, R48, R50, R52, R56, R58	Resistors, 0 Ω	Vishay	CRCW08050000Z0EA

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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